

Serial No. 10/784,886

Attorney Docket No. 11-226-RCE

**LISTING OF CLAIMS:**

The following listing of claims replaces all previous versions, and listings of claims in the present application.

1. (Currently Amended) An apparatus for detecting a rollover of a vehicle, comprising:  
a roll angular velocity detector periodically detecting a roll angular velocity of the vehicle at intervals;  
a memory unit memorizing values of the roll angular velocity periodically detected by the roll angular velocity detector;  
a predictive angular velocity calculator calculating a predictive value of the roll angular velocity to be expected after an elapse of a predetermined period of time on the basis of ~~the values of the roll angular velocity including a present value and~~ a past value of the roll angular velocity memorized in the memory unit; and  
a rollover ~~determination~~ prediction unit ~~determining~~ predicting whether or not there is a possibility that the vehicle will make a rollover, on the basis of the predictive value of the roll angular velocity, and one of: a value of the roll angle of the vehicle and a predictive value of the roll angle to be expected after the elapse of the predetermined period of time.

2. (Currently Amended) The apparatus according to claim 1, wherein the predictive angular velocity calculator is configured to use the present and past values of the roll angular velocity to obtain a derivative of the roll angular velocity and to calculate the predictive value of the roll angular velocity using a Taylor's expansion of the derivative directed to a time instant after an elapse of the predetermined period of time.

Serial No. 10/784,886

Attorney Docket No. 11-226-RCE

3. (Currently Amended) The apparatus according to claim 1, comprising an acquiring unit acquiring a the roll angle of the vehicle, and ~~wherein the~~ a rollover determination unit is configured to perform the determination on the basis of a relationship between a value of the roll angle and the predictive value of the roll angular velocity.
4. (Previously Presented) The apparatus according to claim 3, wherein the acquiring unit is formed as either a unit detecting the roll angle of the vehicle or a unit calculating the roll angle of the vehicle by integrating the roll angular velocity.
5. (Currently Amended) The apparatus according to claim 3, wherein the rollover determination unit is configured to perform the determination in consideration of a relationship between the value of the roll angle and the present and past values of the roll angular velocity.
6. (Currently Amended) The apparatus according to claim 1, comprising a predictive angle calculator calculating a the predictive value ~~to~~ of the roll angle to be expected after the elapse of the predetermined period of time by using the predictive value ~~to~~ of the roll angular velocity, and ~~wherein the~~ a rollover determination unit is configured to perform the determination on the basis of a relationship between the predictive value of the roll angle and the predictive value of the roll angular velocity.
7. (Previously Presented) The apparatus according to claim 3, wherein the rollover determination unit has a two-dimensional map of which dimensions are the roll angle and the roll angular velocity, boundary lines being set on the map to form a first region showing a possibility
- 3

Serial No. 10/784,886

Attorney Docket No. 11-226-RCE

of a vehicle's rollover and a second region showing no possibility of the vehicle's rollover, and means for performing the determination by pointing at a point on the map, the point being defined by both the value of the roll angle and the value of the roll angular velocity.

8. (Currently Amended) The apparatus according to claim 7, comprising

- a lateral acceleration detector detecting a lateral acceleration of the vehicle detectable in a lateral direction of the vehicle;
- a vertical acceleration detector detecting a vertical acceleration of the vehicle detectable in a vertical direction of the vehicle;
- a difference value calculator calculating a difference value of the roll angular velocity using the present and past values of the roll angular velocity memorized in the memory unit;
- a rollover mode determination unit determining a rollover mode of the vehicle based on at least one of the lateral acceleration, the vertical acceleration, the difference value of the roll angular velocity, and the roll angular velocity; and
- a controlling unit controlling positions of the boundary lines on the map depending on the mode of the rollover determined by the rollover mode determination unit.

9. (Previously Presented) The apparatus according to claim 7, comprising

- a lateral acceleration detector detecting a lateral acceleration ~~to be applied on~~ of the vehicle detectable in a lateral direction of the vehicle; and
- a controlling unit controlling positions of the boundary lines on the map depending on a level of the lateral acceleration detected by the lateral acceleration detector.

Serial No. 10/784,886

Attorney Docket No. 11-226-RCE

10. (Currently Amended) An apparatus for activating occupant protective devices mounted in a vehicle, the occupant protective devices being plural in number and being mounted on both lateral sides of the vehicle, respectively, the apparatus comprising:

a roll angular velocity detector periodically detecting a roll angular velocity of the vehicle;

an acquiring unit periodically acquiring a roll angle of the vehicle;

a rollover determination unit performing a rollover determination as to whether or not there is a possibility that the vehicle will make a rollover, on the basis of a value of the roll angle and a value of the roll angular velocity;

an acceleration detector periodically detecting a lateral acceleration of the vehicle detectable in a lateral direction of the vehicle;

a side-impact determination unit performing a first side-impact determination using a value of the detected lateral acceleration to determine whether or not there is a side impact on the vehicle, and a second side-impact determination using the value of the detected lateral acceleration to determine on which lateral side of the vehicle the side impact occurs; and

an activation control unit controlling activation of the occupant protective devices, every device mounted on each lateral side of the vehicle, using results determined by both the rollover determination unit and the side-impact determination unit.

11. (Previously Presented) The apparatus according to claim 10, wherein the acquiring unit is formed as either a unit detecting the roll angle of the vehicle or a unit calculating the roll angle of the vehicle by integrating the roll angular velocity.

12. (Original) The apparatus according to claim 10, wherein the activation control unit is configured

Serial No. 10/784,886

Attorney Docket No. 11-226-RCE

to control one or more devices of the plural occupant protective devices on the basis of a result of the first side-impact determination, the one or more occupant protective devices being mounted on a collision side of the vehicle decided by the second side-impact determination and

to control remaining one or more devices of the plural occupant protective devices on the basis of a result of the rollover determination, the one or more remaining occupant protective devices being mounted on a non-collision side of the vehicle decided by the second side-impact determination.

13. (Previously Presented) The apparatus according to claim 12, wherein

the rollover determination unit has a two-dimensional map of which two dimensions are the roll angle and the roll angular velocity, boundary lines being set on the map to form a first region showing a possibility of a vehicle's rollover and a second region showing no possibility of the vehicle's rollover, and means for performing the rollover determination by pointing at a point on the map, the point being defined by both the value of the roll angle and the value of the roll angular velocity and

the side-impact determination unit is configured to perform the first side-impact determination using a magnitude relation between the value of the lateral acceleration and a predetermined acceleration threshold.

14. (Currently Amended) The according to claim 10, wherein the activation control unit is configured

to control one or more devices of the plural occupant protective devices on the basis of ~~of~~ both ~~of~~ a result of the first side-impact determination and a result of the rollover determination, the one or more occupant protective devices being mounted on a collision side of the vehicle decided by the second side-impact determination and

Serial No. 10/784,886

Attorney Docket No. 11-226-RCE

to control one or more remaining devices of the plural occupant protective devices on the basis of a result of the rollover determination, the one or more remaining occupant protective devices being mounted on a non-collision side of the vehicle decided by the second side-impact determination.

15. (Previously Presented) The apparatus according to claim 14, wherein the rollover determination unit has a two-dimensional map of which two dimensions are the roll angle and the roll angular velocity, boundary lines being set on the map to form a first region showing a possibility of a vehicle's rollover and a second region showing no possibility of the vehicle's rollover, and means for performing the rollover determination by pointing at a point on the map, the point being defined by both the value of the roll angle and the value of the roll angular velocity and

the side-impact determination unit is configured to perform the first side-impact determination using a magnitude relation between the value of the lateral acceleration and a predetermined acceleration threshold.

16. (Currently Amended) The apparatus according to claim 15, wherein the boundary lines on the map are adjustable toward positions closer to an origin of the map; and

the acceleration threshold is adjustable so that the acceleration threshold is lowered.

17. (Previously Presented) The apparatus according to claim 15, wherein the rollover determination unit, including means for performing a further determination determining a magnitude relation between a difference of a current value of the roll angular velocity derived from a value of the roll angular velocity detected last time and a predetermined value, is

Serial No. 10/784,886

Attorney Docket No. 11-226-RCE

configured to cause the rollover determination performing means to perform the rollover determination additionally using a result performed by the further determination.

18. (Previously Presented) The apparatus according to claim 15, wherein the boundary lines on the map are adjustable to positions on the map in a direction departing from an origin of the map.

19. (Previously Presented) The apparatus according to claim 10, comprising a rollover mode determination unit determining whether or not a mode of the rollover is a trip-over, based on a generating direction of the lateral acceleration and a rotating direction of the roll angular velocity,

wherein the activation control unit, when the rollover mode determination unit determines that the mode of the rollover is the trip-over, controls the activation of the occupant protective device mounted on a non-collision lateral side of the vehicle on the basis of the result determined by the rollover determination unit, the non-collision lateral side being determined by the second side-impact determination.

20. (Previously Presented) The apparatus according to claim 10, wherein the occupant protective devices include a side airbag device to be inflated and deployed on an inside wall of a cabin of the vehicle and the activation control unit controls the activation of the side airbag device mounted on a non-collision lateral side of the vehicle in response to the result determined by the rollover determination unit, the non-collision lateral side being determined by the second side-impact determination.